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EXAMINER

GOUDREAU, G

ART UNIT

PAPER NUMBER

1763

DATE MAILED:

08/29/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.

09-352,008

Applicant(s)

Xu et al.

Examiner

George Goudreau

Group Art Unit

1763

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

## Status

- ☒ Responsive to communication(s) filed on (12-00' to 4-01') (ie, - papers # 4-6)
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- ☒ Claim(s) 1-13, 18-29 is/are pending in the application.
- Of the above claim(s) 27-29 is/are withdrawn from consideration.
- ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- ☒ Claim(s) 1-11, 13, 18-26 is/are rejected.
- ☒ Claim(s) 12 is/are objected to.
- ☐ Claim(s) \_\_\_\_\_ are subject to restriction or election requirement.

## Application Papers

- ☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.
- ☐ The proposed drawing correction, filed on \_\_\_\_\_ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119 (a)-(d)

- ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- ☐ All ☐ Some\* ☐ None of the CERTIFIED copies of the priority documents have been received.
- ☐ received in Application No. (Series Code/Serial Number) \_\_\_\_\_.
- ☐ received in this national stage application from the International Bureau (PCT Rule 1.7.2(a)).

\*Certified copies not received: \_\_\_\_\_

## Attachment(s)

- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 25-6
- ☒ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☒ Interview Summary, PTO-413 (7)
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Other \_\_\_\_\_

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15. The examiner has relabelled the claim labeled as claim 1 in amendment A as claim 27 based upon a discussion with applicant's attorney as detailed in the attached interview summary form in order to correct an error made by the attorney in the numbering of this claim.

16. Applicant's election with traverse of the election of the method claims in Paper No. 4 is acknowledged. The traversal is on the ground(s) that the previous grounds of restriction is no longer appropriate due to applicant's amendment to the apparatus claim language. This is not found persuasive because of the following. The examiner previously restricted the apparatus claims from the method claims on the grounds that the apparatus claims require the presence of a coil to generate the plasma which the method claims do not require. Since applicant has amended all of their apparatus claims to not require the presence of a coil to generate a plasma, the previous grounds of restriction between the apparatus, and the method claims are no longer appropriate. This is not found persuasive by the examiner however since the apparatus claims as now amended still require the presence of a plasma generator which is external to the process chamber while the method claims do not require this feature. The plasma may be formed in-situ in the same chamber as that used for etching the substrate in the method claims while it cannot be in the apparatus claims. A parallel plate plasma etcher may be used to both form, and conduct the plasma etching process claimed in the method claims. Thus, although the previous grounds of restriction between the method, and apparatus claims are no longer appropriate, the method, and apparatus claims are still restrict able based upon the same reasons as those stated above.

The requirement is still deemed proper and is therefore made FINAL.

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17. Claims 9, 13, and 18-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

-The wording used in part b of claim 1 is very confusing, and should be rewritten.;

-The word "ethant" in claims 9, and 13 should be replaced with the word "etchant".; and

-The scope of the preamble in claims 18, and 21 fails to match the body of the claims since no means for conducting an etching step is positively recited in the body of the claims as is recited in the preamble of the claims.

18. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

19. Claims 1, 3-7, 10-11, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Ye et. al. (5,756,400).

Ye et. al. disclose a rie etching chamber which is used to etch Al wiring layers on a Si wafer is pre-treated with a plasma which is used to remove etch by products left on the Al walls (122) of the etcher. The plasma cleaning gas may be any of SF6-Cl2 or SF6-O2. The plasma cleaning gas is primarily comprised of SF6 with a small quantity of either Cl2 or O2 additionally present in the plasma etchant. When SF6-O2 is used to clean the Al walls of the etcher a layer of AlOxFy is formed onto the surface of the Al walls. When SF6-Cl2 is used to clean the Al walls

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no deposit of  $\text{AlF}_x$  is formed onto the surface of the walls as long as the concentration of F remains below a targeted value. The  $\text{Cl}_2$  in the plasma reacts with the Al walls of the reactor to inhibit the formation of  $\text{AlF}_x$  on the Al walls of the etcher.

An Al layer on the surface of a Si wafer which is masked with a photo resist etch mask is then plasma rie etched in a plasma comprised of  $\text{Cl}_2$ - $\text{BCl}_3$ - $\text{N}_2$  after the rie etcher has been cleaned using the process taught above. The plasma etchant reacts with the substrate to form a chlorinated etch polymer residue which coats or contaminates the Al walls of the rie etcher.

The Al walls of the rie etcher are then cleaned again using any of the plasma cleaning gases taught above prior to processing additional wafers through the rie etcher. This is discussed specifically in columns 6-14; and discussed in general in columns 1-16. This is shown in figures 1-2.

It would have been inherent that the rate of recombination of the  $\text{Cl}_2$  gas with the Al walls in the rie etcher is different from that of the  $\text{SF}_6$  gas with the Al walls in the rie etcher in the process taught above based upon the fact that the process taught above employs the same etch gasses as those which are claimed by the applicant.

The examiner cites the case law listed below of interest to the applicant in this regard.

In re Swinehart (169 U.S.P.Q. 226 (CCPA )) and In re Best (195 U.S.P.Q. 430 (CCPA )) state that when an examiner has reasonable basis for believing that functional characteristics asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be inherent characteristics of the prior art, the examiner possesses the authority to require an

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applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied upon.

20. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

21. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

22. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ye et. al. as applied in paragraph 19 above.

Ye et. al. as applied in paragraph 19 above fail to disclose the following aspects of applicant's claimed invention:

-the specific deposition rate on the Al walls of the etcher which is claimed by the applicant

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It would have been obvious to one skilled in the art to conduct the plasma etching process taught above such that the specific deposition rates of etch by products which are claimed by the applicant is achieved on the internal surfaces of the rie etcher walls based upon the following. It would have been desirable to conduct the plasma etching process taught above in a manner which minimizes the amount of etch by products formed on the internal surfaces of the rie etcher in order to reduce the possibility of particles flaking off of the walls of the rie etcher during the etching process. Such particles can undesirably lead to the contamination of the surface of wafers processed through the rie etcher during the etching process. This in turn can lead to the undesirable formation of process defects in the wafers being etched in the rie etcher.

23. Claims 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Engelhardt (5,332,468).

Engelhardt discloses a process for rie etching a polysi layer on top of a gate oxide layer on the surface of a Si wafer using a plasma comprised of  $\text{Cl}_2\text{-Br}_2$ . The rie etch is conducted in a parallel plate rie etcher in which a quartz liner surrounds the anode, and the cathode. This is discussed specifically in columns 2-4; and discussed in general in columns 1-8. This is shown in figure 1. Engelhardt fails, however, to specifically disclose the following aspects of applicant's claimed invention.

-the specific etch process conditions which are claimed by the applicant

It would have been prima facie obvious to employ any of a variety of different etch process conditions in the process taught above including those which are specifically claimed by

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the applicant. These are all well known variables in the plasma etching art which are known to effect both the rate and quality of the plasma etching process. Further, the selection of particular values for these variables would not necessitate any undo experimentation which would be indicative of a showing of unexpected results.

24. Claim 12 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

25. Claims 13, and 19-20 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2<sup>nd</sup> paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

26. Claims 21-26 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2<sup>nd</sup> paragraph, set forth in this Office action.

27. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

28. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner George A. Goudreau whose telephone number is (703) -308-1915. The examiner can normally be reached on Monday through Friday from 9:30 to 6:00.

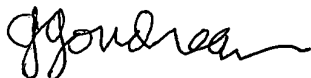
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Examiner Gregory Mills, can be reached on (703) -308-1633. The appropriate fax phone number for the organization where this application or proceeding is assigned is (703) -308-3599.



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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) -308-0661.



George A. Goudreau/gag

Examiner AU 1763